

Financing Distributed Generation

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US DOE Federal Energy Management Program

National Renewable Energy Laboratory

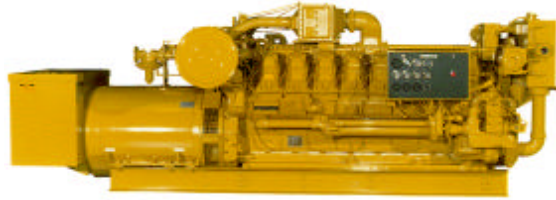
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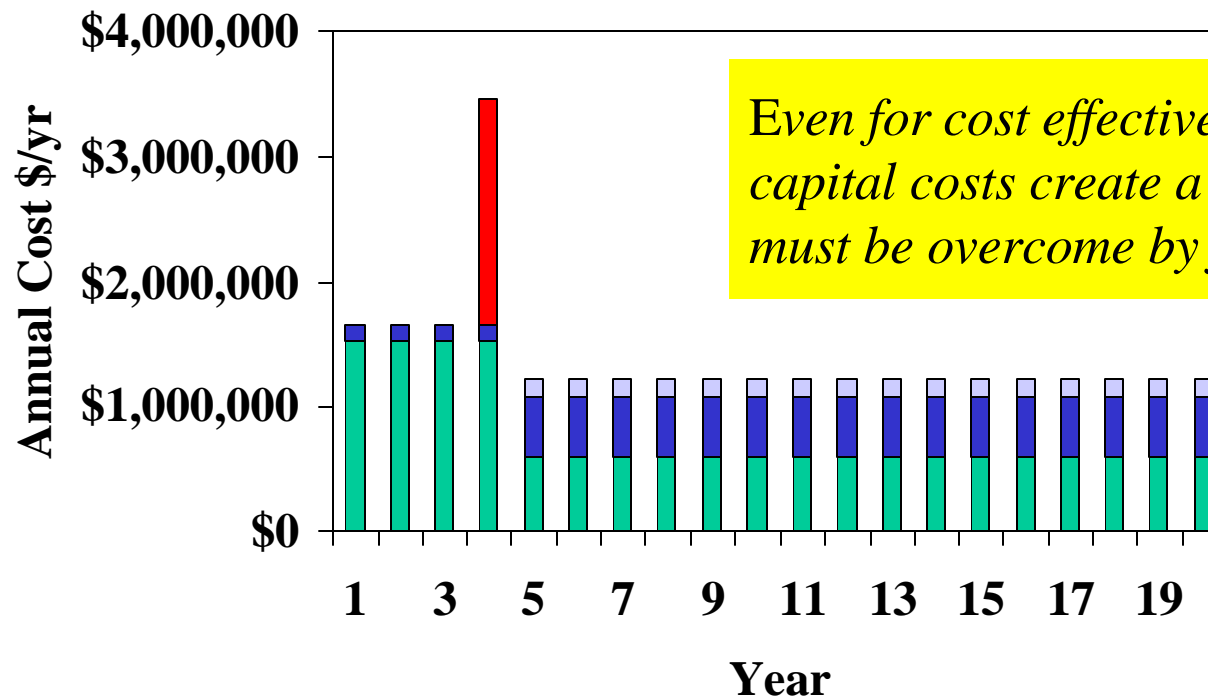
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Consider DER on a California Building



Two 550 kW IC Engines
\$1,815,000 cost installed

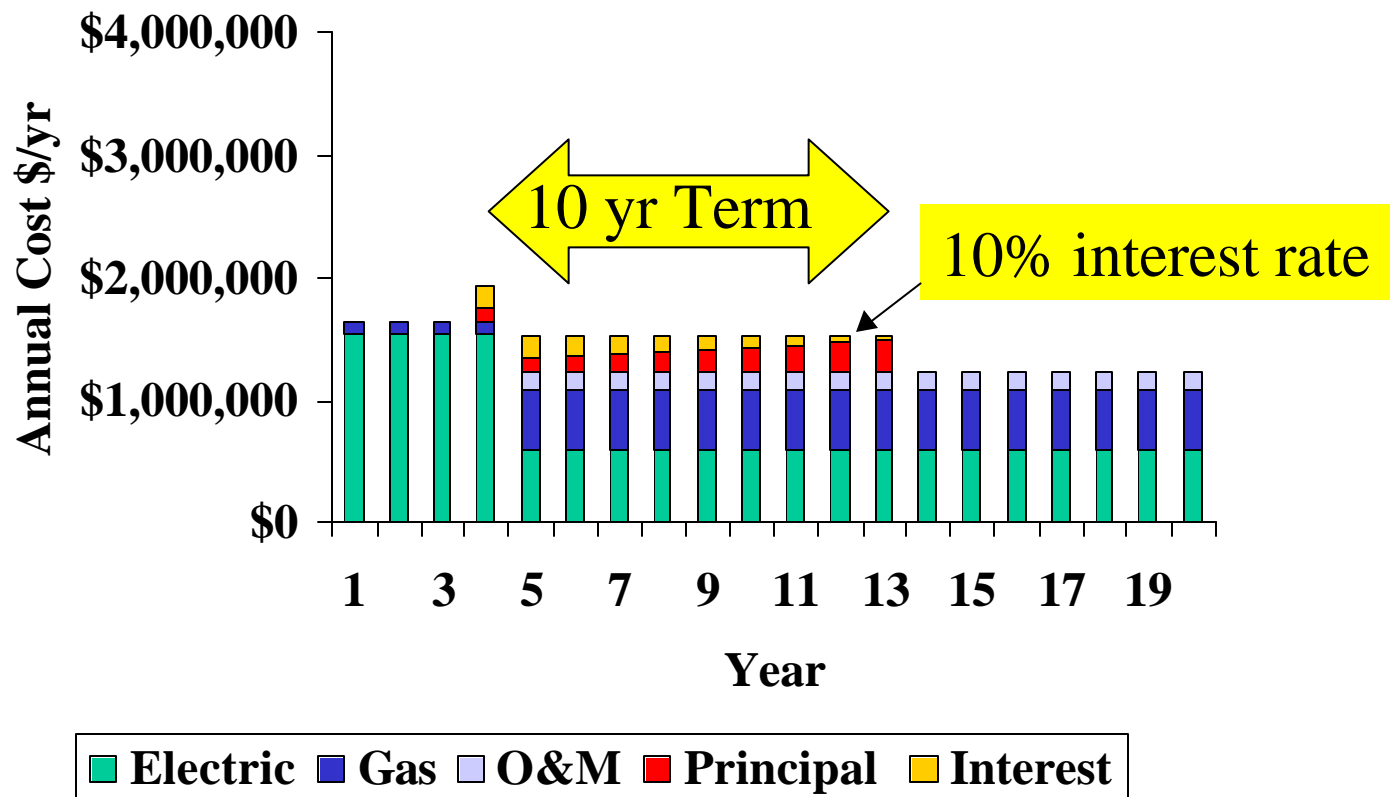
	<u>BaseCase</u>	<u>DER Case</u>
Electricity	\$1,530,000	\$595,308
Gas	\$113,804	\$490,336
O&M		\$135,600
Util. Standby		\$33,660
	<u>Savings=</u>	<u>\$388,900/year</u>



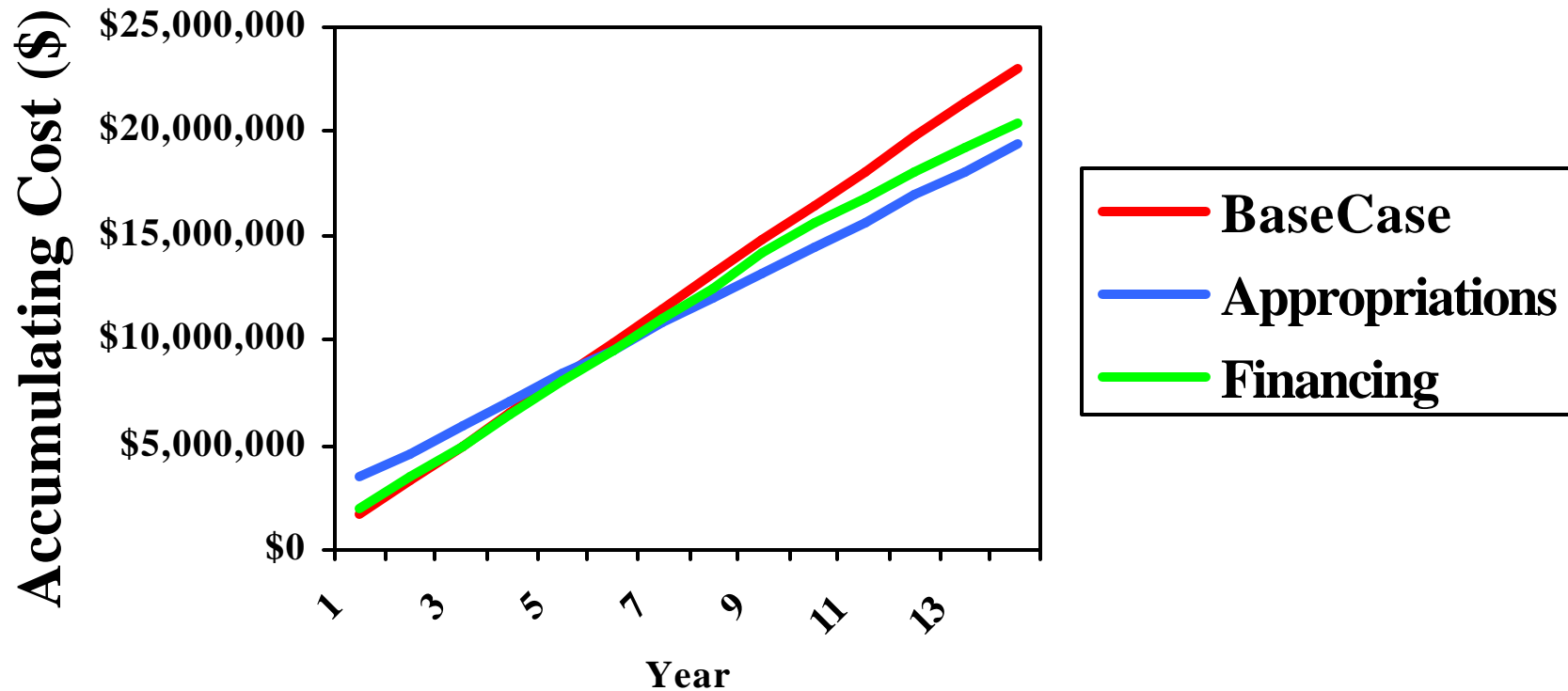
Gas at \$4.88/Mbtu,
Electricity at \$0.0957/kWh

Electric Gas O&M Capital

Financing resolves barrier of high capital cost...

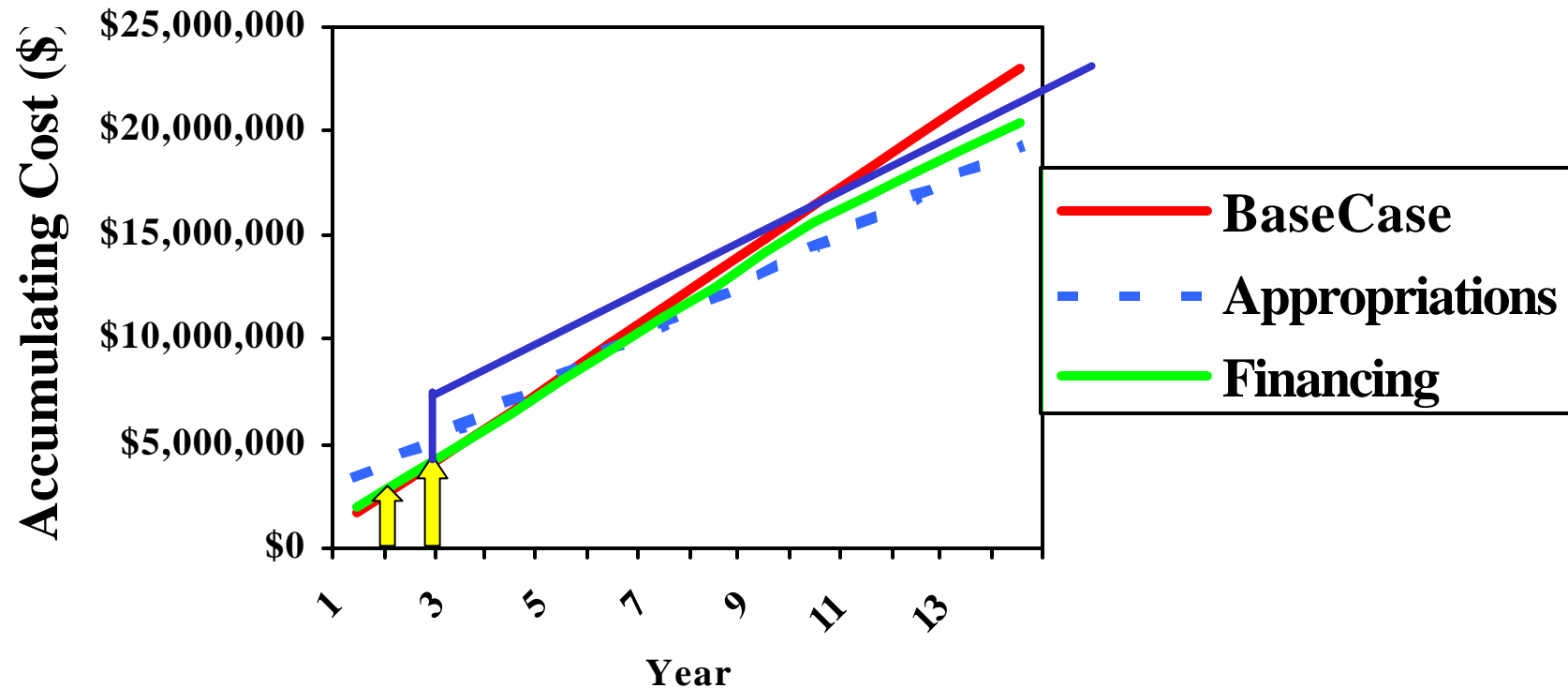


The Cost of Waiting...

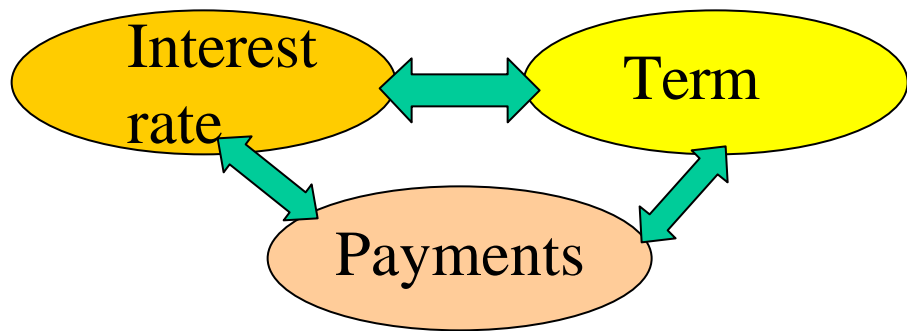


- Appropriations have the lowest Life Cycle Cost, but...

The Cost of Waiting...

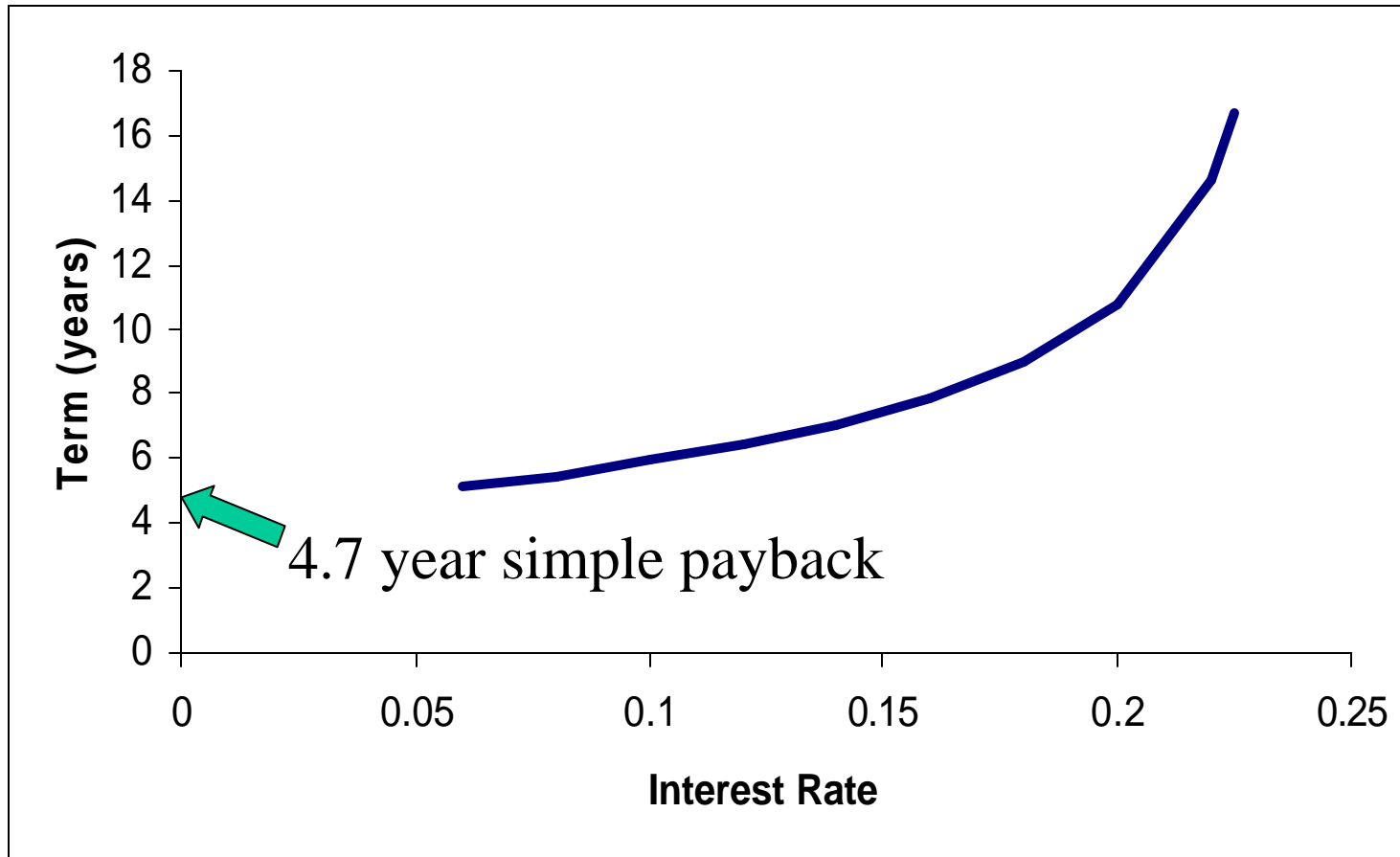


...*Financing now* has a lower Life Cycle Cost than *waiting for appropriations* 2 years.



Interest Rate=index + margin
indices: Prime Rate
LIBOR
Treasury Bills

Required Term for Payments less than \$388,900/yr savings



DER Project Financing

- Appropriations
- Debt (Commercial Bank Loan)
- Mortgage, Home Equity Loan
- Limited Partnership
- Vendor Financing
- General Obligation Bond
- Lease
- Energy Savings Performance Contracts
- Utility Programs
- Chauffage (end-use purchase)
- Grants

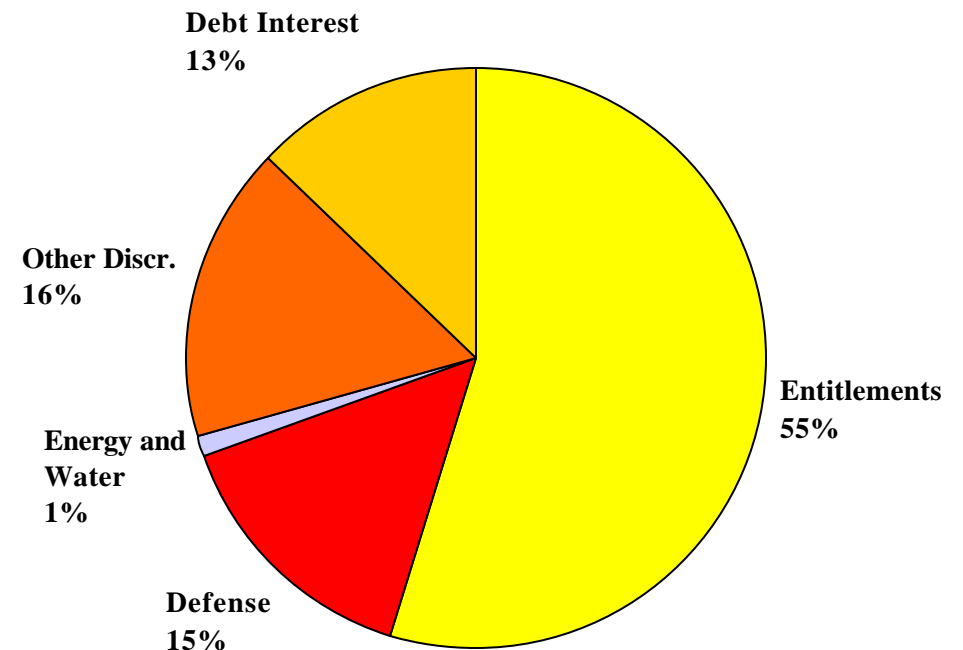
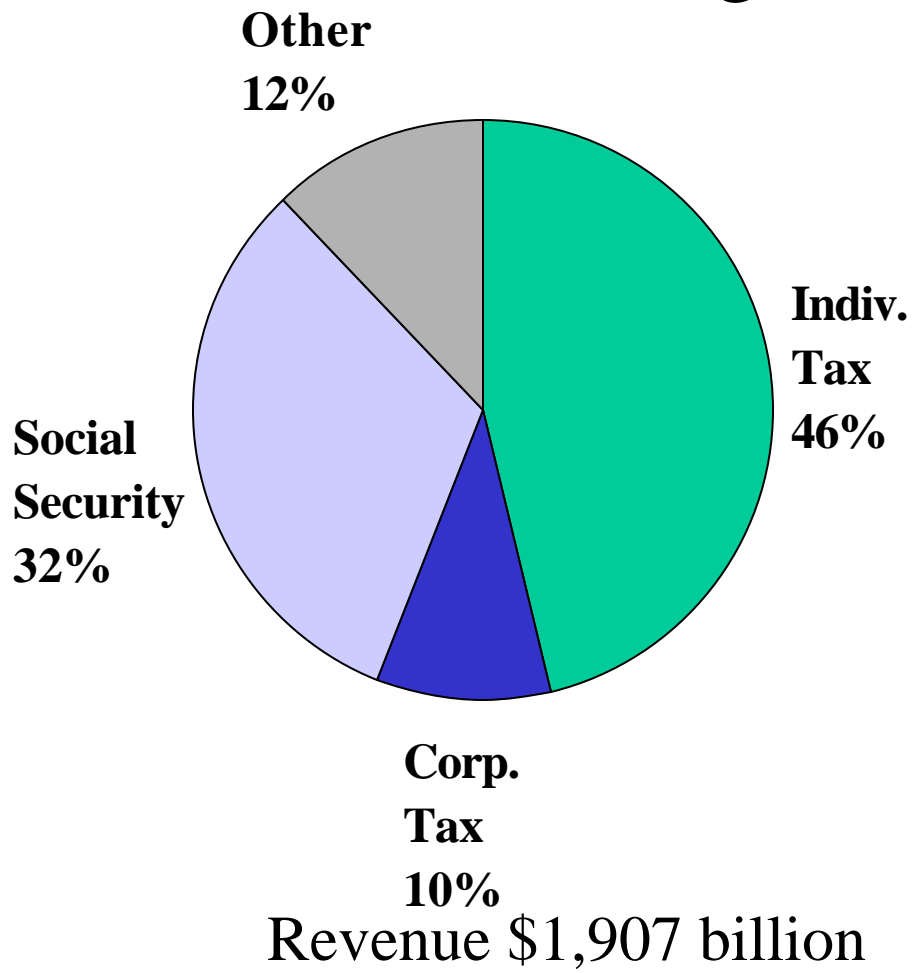
DER Business Financing

- Venture Capital
- Informal Investors “Angels”
- Bank and Debt Financing
- Stock Market

Appropriations

- Using your organizations own money to purchase a system outright.
- Do you have the cash?
- May compete with mission-critical needs for money that your organization may have.
- Cost-effectiveness evaluated using your organization's “Minimum Attractive Rate of Return” (MARR).
- Often represents the lowest “cost of money.”
- For Federal Government the MARR is Treasury Bill Rate of comparable term, currently 3.4% real (net of general price inflation) or 6.3% nominal (including inflation) [NISTIR 85-3273-15, updated annually, 2000].

US Federal Government FY 2000 Congressional Appropriations

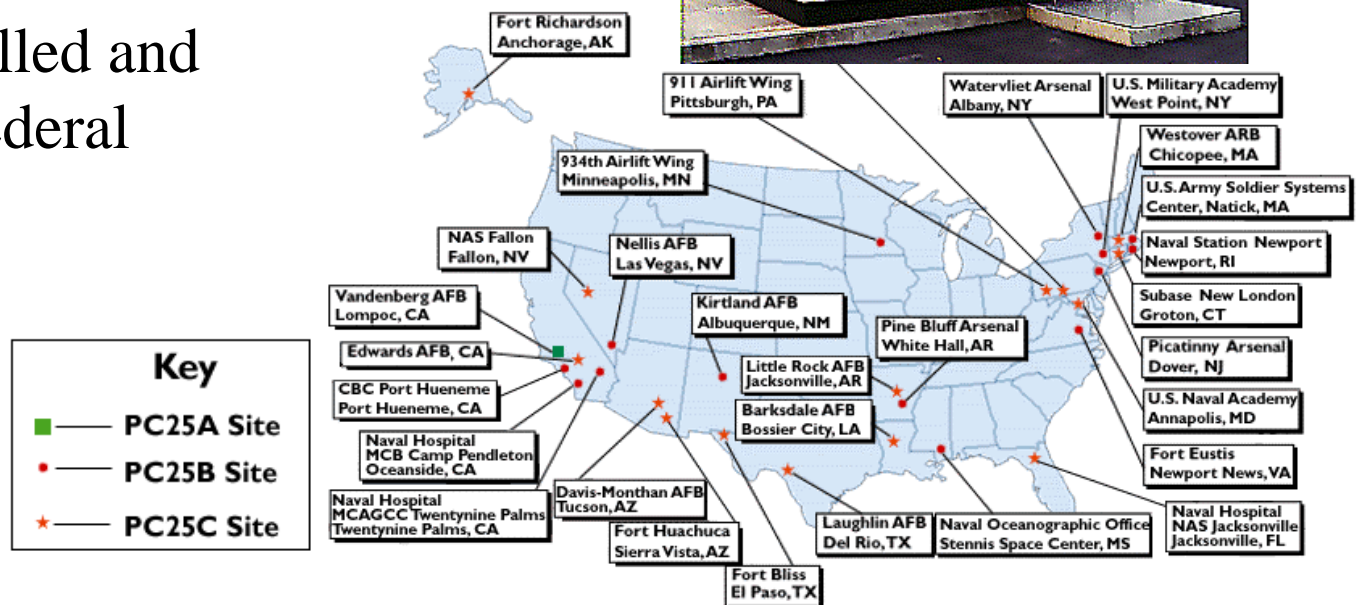


Source: Congressional Budget Office

DER Financing Example: Appropriations

DOD Fuel Cell Demonstration Program

- Congress appropriated
 - \$18 million in FY93
 - \$18.75 million in FY94
- over 30 IFC ONSI 200kW Fuel Cells installed and monitored at Federal facilities



Debt (Commercial Bank Loan)

- Availability depends on credit history and financial statements.
 - **cash flow** to pay loan back.
 - **collateral** if you don't. Leverage debt:equity from 1:1 to 3:1.
- Interest rate “Prime rate” plus a margin of 1 to 6%.
- Fixed payments over term (principal and interest) regardless of project performance.
- “Line-of-Credit” avoids re-application fees.
- Catch 22: If you qualify for a bank loan you don't need one.
 - Example: A company with \$1,000,000 net worth and good income might qualify for \$200,000 loan.
- Allows you to keep your cash for emergencies.
- SBA guarantees up to \$750k for solar thermal, photovoltaics, energy-efficiency, biofuels, industrial cogeneration, hydroelectric power, and wind energy.

Home Mortgage or Home Equity Loan

- Low Interest Rates, Tax Deductible, Long Terms!
- Federal National Mortgage Association (Fannie Mae).
 - Mortgage up to \$240,000, market interest rates, allow 2% increase in debt-to-income ratio for energy efficient home, secured, 30 year term.
 - **Residential Energy Efficiency Improvement Loans** up to \$15,000 (or up to 10% of base loan), below-market interest rates, unsecured, 10 year term.
- Federal Home Mortgage Loan Corp (Freddie Mac).
 - up to \$240,000, market interest rates or variable prime plus 2%, up to 10% above base loan amount with Energy Efficient Mortgage.
- US Dept of Housing and Urban Development (HUD).
 - Up to 10% above base loan amount with Energy Efficient Mortgage.
- US Dept of Veterans Affairs (VA).
 - for veterans. Up to \$230,000, Up to 10% above base loan amount with Energy Efficient Mortgage.

DER Financing Example: Energy Efficient Mortgage

Dorothy and Jerry Wheeler Home Mortgage



- 960 Watt PV on new home in Tucson
- PV was \$12,000 of \$280,000 loan
- 30 year term 7.8% interest
- Payments \$87/month *fixed*
- Utility savings*, Tax benefits, reliable, silent, no pollution.
- Included in appraisal (resale).

* \$16.5/ month with 6.5 kWh/m²/day solar and \$0.0868/kWh power

Limited Partnership

- General Partnership.
- Limited Partnership.
- No guaranteed rate-of-return (depends on project performance).
- Strategic alliances (eg. Gas LDC partners with DG supplier).

DER Financing Example: Limited Partnership

Solar Water Heating Jefferson County Jail

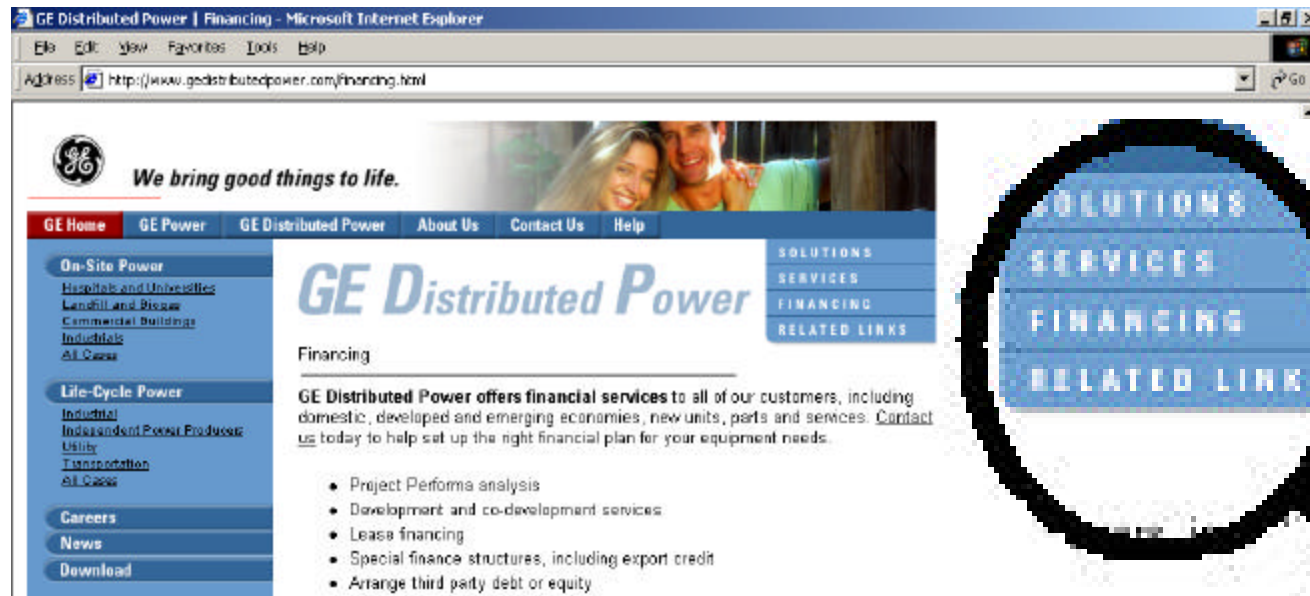


- 7,200 ft² solar trough system
- \$160,000 installed cost financed by limited partners
- 15 years of O&M (\$1,800/year) included in price
- Heat sold to prison at 90% of cost of natural gas
- Investors paid back from revenue, but \$8000 per year minimum

Vendor Financing

- Suitable for small projects (\$25,000 to \$400,000).
- Often represents a low “cost of money” if the vendor profits from the sale.
- Often effective for large facilities to establish “lines-of-credit” with one or more vendors.
- Lighting vendors most common example.
- Quick and easy, can even be applied for on some vendor’s websites.
- Automobile analogy: GMAC (a model for growth).

DER Financing Example: Vendor Financing



- GE Distributed Power from 300 kW to 15 MW.
- Lease; Debt; Equity; Preferred Stock; Partnerships; 3rd Party
- \$19 billion, 15 gigawatts financed since 1982.

General Obligation Bond

- Secured by assets or by the “Good Faith and Credit” of Issuer.
- GOBs issued by state or local governments.
- Interest rate often low, depends on market and on rating of bonds.
- Process of issuing GOB long and complicated.

Lease

- Capital Equipment Lease
 - appears on the balance sheet as debt
 - transfer of ownership at end of lease, dollar buyout clause
 - lease term 75% of equipment lifetime
 - net present value of lease payments 90% of equipment value
- Operating Lease
 - appears as operating expense, not debt, on balance sheet
- Municipal Lease
 - tax exempt under 103c of IRS Code (1986)
 - below-market rates similar to GOBs

Energy Savings Performance Contracts (ESPC)

- Energy Service Company (ESCO) finances measure in exchange for a share of the energy cost savings.
- Risk of project performance often on the ESCo.
- Interest rates prime plus 1.25 to 1.5 % depending on recourse or non-recourse and perceived risk.
- For Federal projects, payments cannot exceed savings and term cannot exceed 25 years. In practice, term is often less than 15 years.
- Examples include several hundred million dollars worth of projects.

DER Financing Example: Energy Savings Performance Contract

Phoenix Federal Correctional Institution

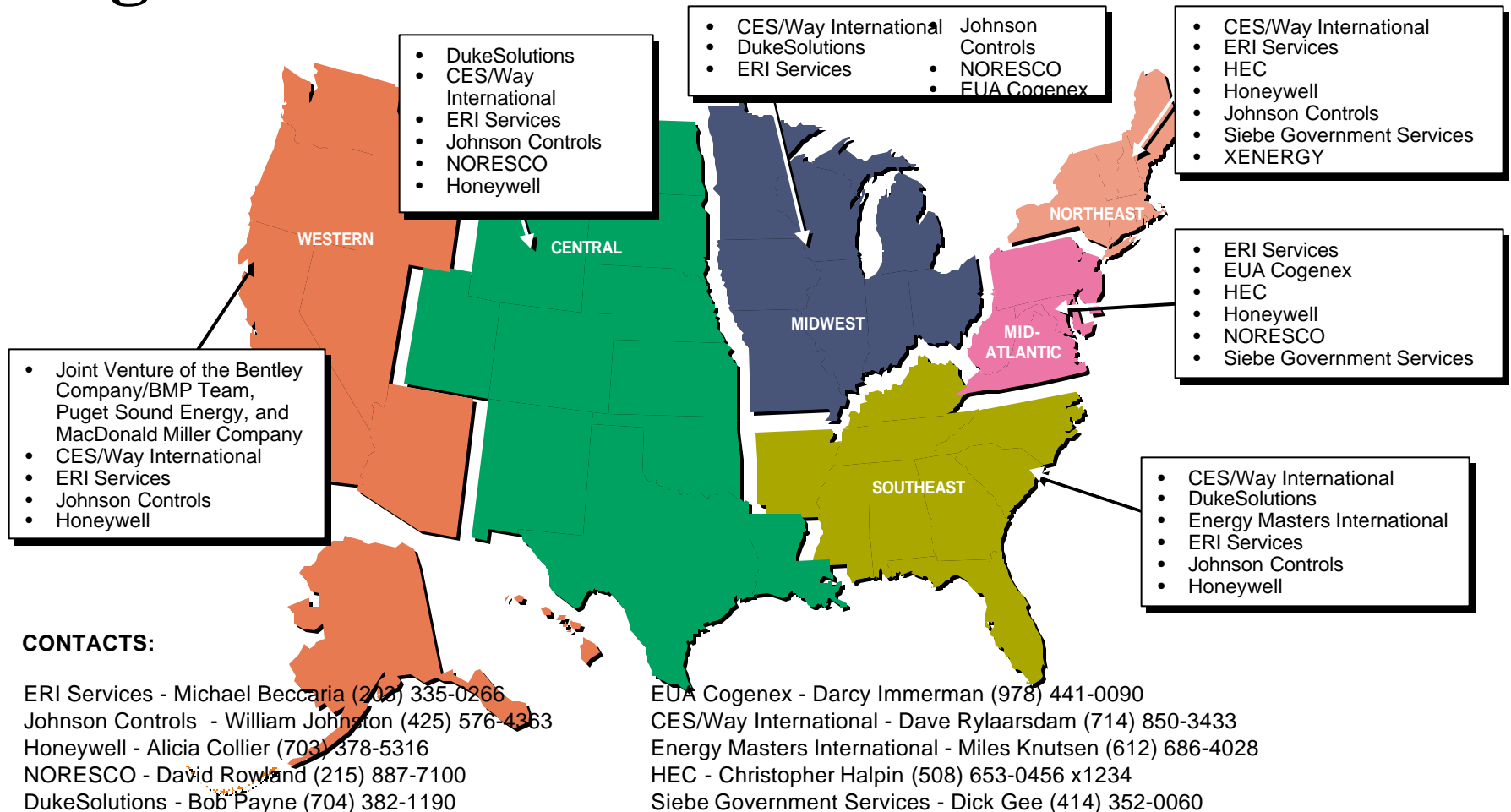
Solar Water Heating ESPC



- Installed cost of \$650,000 for 17,040 ft² solar field
- Delivered 1,161,803 kWh in 1999
- Saved \$77,805 in 1999 at \$0.067/kWh.
- Prison paid Industrial Solar Tech. \$70,025 (10% savings)
- Term 20 years.

Super ESPC Regional Contracts

Regions and Contractors



CONTACTS:

ERI Services - Michael Beccaria (202) 335-0266
 Johnson Controls - William Johnson (425) 576-4363
 Honeywell - Alicia Collier (703) 378-5316
 NORESO - David Rowland (215) 887-7100
 DukeSolutions - Bob Payne (704) 382-1190
 XENERGY - Ken Nathanson (781) 273-5700 x348
 Bentley/Puget Sound/MacDonald Miller - Robert Turley (510) 543-3500

EJA Cogenex - Darcy Immerman (978) 441-0090
 CES/Way International - Dave Rylaarsdam (714) 850-3433
 Energy Masters International - Miles Knutsen (612) 686-4028
 HEC - Christopher Halpin (508) 653-0456 x1234
 Siebe Government Services - Dick Gee (414) 352-0060

Facility Managers are also encouraged to contact GSA and inquire about their areawide utility partnerships. The majority of the U.S. is covered by these agreements. Call Linda Koman at (202) 501-5543 for further details.

DER Financing Example: Super ESPC

USDA/Johnson Controls Gas Turbine Super ESPC



- 1.2 MW Gas Turbine with cogen heat in Ames, Iowa
- \$378,000/year savings due to DER
- \$6.3 million investment cost (includes other measures)
- 17 year term, 7.67% interest (index plus 2.38%)

Utility DER Financing

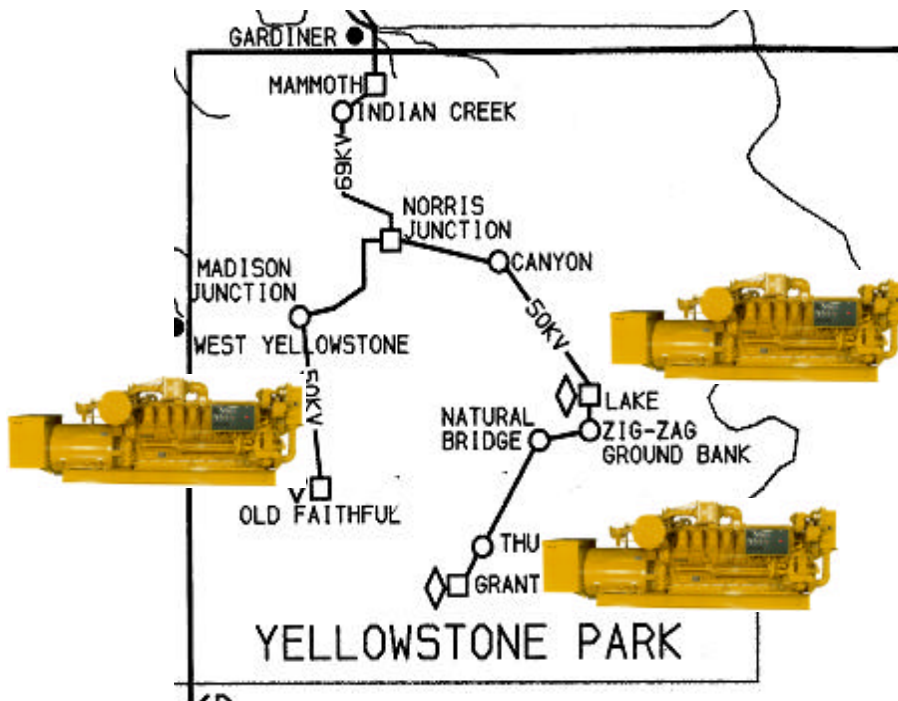
- DER substitute for wire-based revenue
 - Utility DER services by unregulated energy services business
 - Utility arranges third-party, non-recourse financing
 - *"If they don't and rates go up sharply, people are going to buy their own solar panels and pull the plug on the utilities." ... " David Freeman, SMUD.*
- DER to cut cost and enhance wire-based revenue

Utility Programs

- DER financed through contracts and ordering agreements.
- Utility Incentives.
 - Demand Side Management (DSM) Bidding Programs,
 - DSM Rebates.
 - Example: Hawaiian utilities offer \$800 rebate for residential solar water heaters.
- DER provided through tariffs.
 - approved by State Public Utility Commissions.
- DER to supply Green Power Purchases.
 - electric power generated from renewable energy resources.
 - certified by third party.
 - often sold at premium price.

DER Financing Example: Wire Revenue Utility Contract

MPC Yellowstone National Park



- DER in Yellowstone
 - 2,750 kW Lake
 - 1,000 kW Old Faithful
 - 1,600 kW Grant
- \$12.5 million investment
- 10 year term
- 8.9% rate of return for Montana Power Company
- Diesel Generators
- 3.9¢/ kWh energy
- + 10.1¢/kWh financing and O&M
- 14 ¢/kWh

DER Financing Example: Utility Tariff

Joshua Tree National Park PV System



- 20.5 kW PV Array
- \$273,000 cost financed by Southern California Edison
- Monthly payments \$4,368: 9.94% interest plus O&M
- 15 year term

DER Financing Example: Utility Green Power

Arizona Public Service “Solar Partners”



- 82 kW in Flagstaff, \$750,000 minus 2/3 cost share.
- Solar Partners pay \$3/month per 100 W = \$29,500/yr (12% ror)
- Program oversubscribed in 3 weeks, 1/3 willing to pay more for green power.
- Similar system in Tempe

Chauffage

- Instead of buying an energy system, buy the end use of what that system provides.
 - chilled water, heat, light.
- Risk of non-performance is on the owner/operator of the equipment.

Grants and Donations

- Often available from the government to promote new technologies or support government programs
- Sometimes available from other environmental or philanthropic organizations
- A two edged sword (“Why should I finance it now if I might get a grant later?” But the grant never comes.)

DER Financing Example: Grants

Federal Energy Management Program

- FEMP DER Call For Projects
- \$400 k in FY 2001
- For Federal Agencies:
 - Design Assistance
 - Hardware Purchase
- Applications due March 16, 2001
- web site:
www.eren.doe.gov/femp/newsevents/callforDER.html



Venture Capital

- Buys shares or bonds of a company.
- want growth rather than dividends, desired IRR of 40 to 60%.
- Not less than \$250,000 investment size.
- Look for Intellectual Property Rights and Market Potential (high with DER now).
- Venture Capitalist brings business experience and contacts but may want some control (seat on the board).

Informal Investors, “Angels”

- Wealthy individuals, retired execs.
- Buy shares, no IRR requirements.
- Less than \$50,000 (\$250,000 from syndicates) with little follow-up financing.
- Hands on, often a personal interest.
- No fees or lengthy application, but difficult to find Angels.

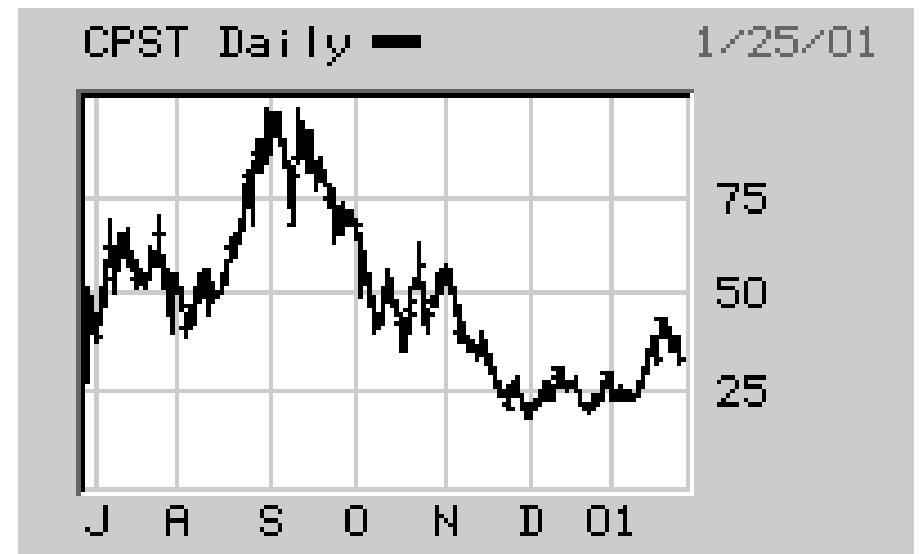
Stock Market

- Initial Public Offering (IPO).
 - exit for venture capitalist.
- loss of control proportional to the amount of equity that is sold to outside investors.
- No reimbursement and no interest to pay.
- Rigorous entry standards and discipline.
- Share price volatility (risk to raise more capital).

DER Financing Example: Stock Market

Capstone Turbine Corp.

- Capstone Turbine Corp. IPO (initial public offering) of common stock on NASDAQ June 29, 2000
- Net proceeds estimated \$133.3 million
- Underwriting team: Goldman, Sachs & Co.; Merrill Lynch & Co.; Morgan Stanley Dean Witter.
- 9,090,909 shares priced at \$16/share



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For More Information

- Visit the FEMP Web Site:
 - <http://www.eren.doe.gov/femp>
- Phone the FEMP Help Desk
 - 1-800-363-3732

References

- Financing Energy Projects Deskbook
Albert Thurman Fred Wainwright ISBN 0-88173-272-9 The Fairmont Press Inc.
- The Borrowers Guide to Financing Solar Energy Systems, DOE/GO-10098-660, September 1998, NTIS (703) 487-4650
- Financing Innovation Website
<http://www.cordis.lu/finance/src/acc-fin.htm>